

prohibitive increases in costs of implementing Little LEO systems which may destroy their very market value.

B. The Commission Should Not Impose Unrealistic Financial Qualifications

The Commission has proposed more stringent financial qualifications to require demonstration of finances necessary to construct, launch and operate an entire system for a year.⁹³ Final Analysis does not believe that this is necessary or appropriate. First, as demonstrated herein, the time sharing requirements proposed by the Commission preclude implementation by Final Analysis and perhaps other applicants of their fully proposed systems. Therefore, requiring a financial showing for an entire system may create a mismatch between the required financial showing and the costs that actually will be incurred. More importantly, Little LEO systems all must be implemented in phases over the course of a few years. Typically, it may take four to five years before a full constellation of 20 or more satellites may be placed in orbit. Over that timeframe, the operator presumably would be earning revenues from customers of low frequency polling services. Thus, a system may be commercially viable, even before it is fully implemented, and full financial capability for the entire constellation is not required at the outset. In fact, because most, if not all, Little LEO licensees and applicants acknowledge that it takes a couple of years to get the first two satellites into orbit, Final Analysis believes that the current financial qualification standard is most appropriate.

However, Little LEO systems require extremely sophisticated technology, not only in the space stations and constellation design, but also in the ground segment, particularly

⁹³ Notice at ¶¶ 39-40.

customer terminals. Deployment of a Little LEO constellation also involves commitment of significant launch services. Additionally, the time sharing and other constraints proposed by the Commission in the Notice require very sophisticated capabilities that not every Little LEO applicant may be able to readily meet. In light of these factors, Final Analysis submits that there is more risk of licensing an applicant that may be technically unqualified than one that may be under-financed.⁹⁴

C. In Any Event Due Diligence and Milestone Requirements Would Ensure Efficient Spectrum Utilization.

In the satellite area, the Commission consistently has employed due diligence and construction milestone requirements to promote the goals of efficient spectrum utilization. Final Analysis encourages the Commission to establish similar due diligence and construction milestone requirements in this proceeding to promote these goals for Little LEO services.

In establishing due diligence factors in the 1986 Tempo decision, the Commission specifically required that the applicant show that:

[t]here is a contract, signed by both parties, which contains no unresolved contingencies which could preclude substantial construction of the satellites.
The essential terms of the contract are verified by the submission of relevant

⁹⁴ The Commission has required in the direct broadcast satellite context, for example, that an applicant submit "a detailed description of the design characteristics and specifications of the satellite to be constructed." See United States Satellite Broadcasting Company, 7 FCC Rcd 7247, 7250 (Mass Media Bur. 1992) ("USSB"). The Commission also has required satellite applicants to submit details regarding contracts with satellite construction contractors. See id.; see also Tempo Enterprises, Inc., 1 FCC Rcd 20, 21 (1986) ("Tempo"). In this proceeding, the Commission might consider, for example, requiring additional showings of technical competence as follows: (1) submission of separate bona fide commitment letters from each manufacturer of the following critical subsystems: (i) spacecraft, (ii) launch vehicle, and (iii) gateway round station; (2) identification of the entity that has performed, is performing or will perform necessary R&D and manufacture for first prototype customer terminal or terminals; and (3) identification of the entity that will perform in-orbit spacecraft operations for one year.

portions of the document or by the principal's sworn statement as to the contents, verified by . . . [the satellite construction contractor]. Specific satellites and their design characteristics are identified, and dates for the completion of construction are specified.⁹⁵

In a subsequent digital broadcast satellite decision, the Commission subsequently clarified the contractual details that must be provided to demonstrate due diligence.⁹⁶ The contracts or contract descriptions must include "regular[,] specific construction milestones in the construction timetable" and "payment schedules with sufficient specificity for the Commission to determine that the permittee is making a financial commitment to the construction of the satellite and to indicate that the milestones listed for the early stages of construction constitute meaningful levels of advancement in the satellite construction process."⁹⁷

Furthermore, the public interest benefits of imposing due diligence and construction milestone requirements on satellite applicants are well established. First round Little LEO permittees, for example, are required to begin construction of at least two satellites within one year, and the remainder of the satellites in a system within three years.⁹⁸ Furthermore, the Commission has specifically acknowledged that due diligence and milestone standards are effective in the mobile satellite service in preventing warehousing and inefficient spectrum utilization, stating that

⁹⁵ See Tempo, 1 FCC Rcd at 21.

⁹⁶ See United States Satellite Broadcasting Company, Inc., 3 FCC Rcd 6858, 6861-2 (1988).

⁹⁷ See id.

⁹⁸ Construction of the first two satellites must be completed in four years. See Little LEO Order, 8 FCC Rcd 8450 at ¶ 18.

. . . strict application in satellite services of financial qualification requirements, *construction milestones and other due diligence requirements lessens our concern that the satellite licensing process may attract applicants filing for purely speculative purposes.*⁹⁹

If any Little LEO operator licensee applicant fails to meet construction milestone and due diligence qualifying standards, its license should be subject to cancellation.¹⁰⁰ These eligibility requirements will promote spectrum efficiency by demonstrating a Little LEO applicant's "investment/commitment to completion of the system."¹⁰¹ Accordingly, imposing construction milestone and due diligence standards with "use-it-or-lose-it" consequences for Little LEO operators will best promote efficient use of spectrum.

D. Part 25 Should be Modified to Permit Amendments Consistent With the Technical Characteristics of Little LEO Systems

The Notice proposes to require amended applications to conform to Part 25 of the FCC's rules and to include technical and financial information required by Part 25 of the rules. Applicants must indicate in which spectrum block(s) they propose to operate, as well as technical parameters of their systems and time-sharing techniques with NOAA and DoD.

As an initial matter, Final Analysis believes that the current requirement that second round applicants submit amended applications before the band plan is finalized is premature and unwise. Particularly in light of the fact that Final Analysis, and perhaps other commenters, suggest alternate band plans and sharing arrangements, it is possible that the

⁹⁹ See STARSYS Global Positioning, Inc., 11 FCC Rcd 1237, 1238 n.16 (Int'l Bur. 1995); see also Constellation Communications, Inc., 3 Comm. Reg. (P&F) 703, 711 (1996).

¹⁰⁰ See CBS, Inc., 98 F.C.C.2d 1056, 1061 (1984) (dismissing direct broadcast satellite applicant for failure to show due diligence) ("CBS").

¹⁰¹ See Dominion Video Satellite, Inc., 10 FCC Rcd 10480, 10481 (Int'l Bur. 1995) (quoting Tempo, 1 FCC Rcd at 21).

final resolution of this proceeding will require amendments quite different from those contemplated in the Notice. Under these circumstances, requiring applicants to submit amendments in accordance with the Notice may prove wasteful of corporate as well as Commission resources. Final Analysis recommends that the Commission consider further delay of the amendment deadline until a final band plan has been determined.

In any event, Final Analysis requests that the Commission clarify that applicants should be permitted to maintain proposals on file for full constellations, as originally proposed, that ultimately will be able to provide near real time services, as originally contemplated, even if certain aspects of these system proposals cannot be fully implemented under the partial or interim license grants that are possible at this time.

Finally, Final Analysis urges the Commission to clarify, or to modify Part 25 of the Commission's rules as necessary, that application or system modifications pertaining merely to numbers of satellites or orbit parameters, including altitude, do not necessarily constitute major modifications. Such changes should be recognized as minor modifications if in fact no additional spectrum is utilized and no additional interference is created. In this respect, Part 25 does not accurately, or adequately, reflect the unique characteristics of Little LEO satellites, in comparison to geostationary satellites. In the latter case, addition of satellites and/or modification of orbit parameters dramatically changes the potential for interference with other satellite systems. In the case of Little LEOs, however, significant modifications may be made to constellation design without having any material impact on any other systems. Thus, subject to international coordination, such changes should be considered minor, and applicants should be permitted to file applications for them without running the risk of opening another processing round.

E. Using an \$11 Million Benchmark to Define a "Small Entity" Will Skew the Regulatory Framework for Little LEO Licensees.

The \$11 million revenue benchmark asserted in the Notice as a measure of qualification as a small business¹⁰² is inappropriate and could lead to a very skewed regulatory framework. If the Commission decides to auction Little LEO spectrum and identifies designated entities (although Final Analysis believes that auctions are not warranted or in the public interest), an \$11 million small entity benchmark could have possibly defective results. Any small business standard for the purpose of identifying designated entities in a Little LEO auction, therefore, should initially be referred to the Small Business Administration ("SBA").

As an initial matter, it is the province of the Small Business Administration (SBA) to determine appropriate Standard Industrial Classification ("SIC") codes and revenue thresholds for small business classifications applicable in different industries. The SBA has not established an appropriate SIC code for satellite operators. The SIC code upon which the Commission's proposal, Code 4899 - "Communications Services, Not Elsewhere Classified," applies to terrestrial systems.¹⁰³ In fact, there is no appropriate SIC code for satellite system operators. Clearly the characteristics of firms involved in such a highly technical and capital intensive industry are very different from the terrestrial operations covered by Code 4899.

¹⁰² See Notice at Initial Regulatory Flexibility Analysis, Appendix A.

¹⁰³ Code 4899 refers specifically to: radar station operation, radio broadcasting operated by cab companies, satellite earth stations, satellite or missile tracking stations operated on a contract basis, and tracking missiles by telemetry and photography on a contract basis. 13 C.F.R. § 121.201.

In any event, even if a benchmark of \$11 million in revenues is used, the results suggested by the Commission is not necessarily correct, particularly with respect to LEO One. LEO One's financial resources are in a trust, and are not fully known to the Commission or any of the other parties. Final Analysis suggests that no entity should be eligible for a designated entity classification unless and until the Commission can fully verify that all of the financial resources available to that company are taken into account.

Finally, use of an \$11 million revenue benchmark in this case would lead to skewed and possibly defective results. Of the two companies the Commission proposes to classify as designated entities, VITA and LEO One, only LEO One could reasonably be expected to participate in an auction. VITA as a non-profit entity with minimal spectrum requirements would not be a likely bidder. Thus, LEO One conceivably could be the sole designated entity in the auction. The Commission cannot hold a special auction for just one entity. Grant to LEO One of any other special and singular consideration as a consequence of its purported status as a small business would seriously prejudice the other parties to this proceeding.

Especially because an auction in this proceeding would be conducted among a very small and defined group of participants, none of which currently have a Little LEO system in operation, accordance of any special consideration to any of the applicants on the basis of revenues creates arbitrarily discriminatory conditions. Furthermore, Section 309(j)(3)(B) provides that auctions are in the public interest only if they will:

promot[e] economic opportunity and competition and ensure that new and innovative technologies are readily accessible . . . by avoiding excessive concentration of licenses and by disseminating licenses among a wide variety of applicants, including small businesses, rural telephone companies, and businesses owned by members of minority groups and women.

47 U.S.C. § 309(j)(3)(B). The auction approach set forth in the Notice would not achieve these objectives. The very fact that the statutory requirements for consideration of designated entities cannot be fairly achieved in this context further indicates that an auction procedure is inappropriate here.

VI. THE COMMISSION SHOULD ADOPT CONSISTENT SERVICES RULES

A. In Protecting Against Unauthorized Transmissions Licensees Should Not be Required to Take Steps that Significantly Increase the Cost of NVNG MSS.

The Notice seeks comment on effective methods for preventing unauthorized transmission and the costs related to each method.¹⁰⁴ One alternative proposed is to require each Little LEO user terminal to be equipped with position determination capabilities that would prevent transmissions in countries from which they are not authorized to transmit. Final Analysis believes that the Commission should not adopt any requirements regarding unauthorized transmissions steps that significantly increase Little LEO licensee costs.

Final Analysis has the capability to determine the position of its fixed remote user terminals, as proposed in the Notice. Any further requirements or international accommodations regarding unauthorized transmissions from mobile Little LEO user terminals, as with other mobile communications end user equipment, should properly be addressed in international discussions regarding the Global Mobile Personal Communications by Satellite Memorandum of Understanding ("GMPCS MOU").¹⁰⁵

¹⁰⁴ Notice at ¶ 101.

¹⁰⁵ See Susan Schorr, "ITU Hails Outcome of First-Ever WTPF," TR International at 2-3 (November 8, 1996) (World Telecommunications Policy Forum participants adopt draft memorandum of understanding on policy and regulatory issues raised by the introduction of global mobile personal communications by satellite).

B. Exclusive Arrangements With Foreign Countries Should be Prohibited

The Notice seeks comment on whether the Commission should adopt limitations on a licensee's ability to enter into exclusive arrangements with other countries concerning communications to or from the United States. Little LEO operators should not be permitted to enter into exclusive deals with foreign countries. This is contrary to the "open skies" approach to Little LEO services and potentially raises an entry barrier for others.

C. Existing Rules Should be Maintained

Final Analysis supports the Commission's proposal to require second round Little LEO systems to comply with the FCC's existing rules and policies governing Little LEO system licensing and operation.¹⁰⁶ Little LEOs should not be required to provide service on a common carriage basis. The Commission should issue a blanket license for the space segment, a ten year operating license for the system that begins to run when the first LEO satellite is launched, authority to replace the older satellites in the system as they are retired, a filing window for next generation system proposals, and system implementation milestones.¹⁰⁷

¹⁰⁶ See Notice at ¶ 107.

¹⁰⁷ Id. at ¶ 107.

VII. CONCLUSION

For the reasons discussed above, Final Analysis urges the Commission to adopt the proposals advanced in the foregoing discussion. Adoption of these proposals will facilitate ultimate implementation of fully competitive Little LEO systems in the public interest.

Respectfully submitted,

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LITTLE LEO MARKET ANALYSIS

FINAL ANALYSIS COMMUNICATION SERVICES, INC.

I. Introduction and Summary

Final Analysis has undertaken this detailed Market Analysis in response to the specific questions posed in the Notice at ¶¶ 21-37.¹ The Commission proposes the use of the structure-conduct-performance ("SCP") paradigm.² The information in this Market Analysis is drawn from Final Analysis's ongoing internal marketing efforts and studies.

While this Market Analysis reviews some of the limitations of the SCP approach in order to clarify some of the qualifications that must be made regarding the results, Final Analysis has found the SCP paradigm to be useful in principle.³ It has not been possible, however, to construct a formal SCP model because in such an emerging market as the Little LEO industry, data for many of the necessary input parameters simply do not exist. Therefore, the following analysis identifies factors that are responsive to each aspect of the SCP paradigm.

¹ Assistance in the preparation of this Market Analysis has been given by the Brattle Group, Cambridge, Massachusetts.

² Final Analysis notes the SCP paradigm is viewed by some as a more of a stage in the history of economic thought rather than a well-established body of knowledge. Jean Tirole, The Theory of Industrial Organization (Cambridge, MA: The M.I.T. Press, 1989), pp. 1-2. Also, several different but equally credible paradigms are relied upon by industrial economists in conducting market studies. Some, such as the SCP approach, may be more appropriate for mature markets. Others may more explicitly take into account emerging market factors and implications of new entrants. E.g., Porter, Michael, Competitive Strategy: Techniques for Analyzing Industries. New York: The Free Press, 1989). Final Analysis believes that the Commission need not be constrained by any one paradigm, and that use of any of them will most likely produce similar results, namely that more entry would be beneficial. As Final Analysis points out in the main text of its Comments, this result is completely consistent with existing Commission policy and precedent.

³ In fact this is consistent with the current view of the SCP paradigm as indicating "empirical regularities," i.e., statistical relations, between structure, conduct and performance, rather than immutable laws of cause and effect. See Richard Schmalensee, "Inter-Industry Studies of Structure and Performance," Chapter 16 in Handbook of Industrial Organization, Vol. II, Richard Schmalensee and Robert D. Willig, eds. (Amsterdam: North-Holland) 1989.

This Market Analysis demonstrates that Little LEO markets are comprised of diverse and varied submarkets, each associated with different technical characteristics of Little LEO systems, and each with separate demand and supply characteristics. Thus, it is difficult to generalize, under the SCP model, as to the ultimate overall structure and performance of the Little LEO market.

Nonetheless, it can be seen that, while services are on a continuum of demand elasticity and substitutability, all submarkets can benefit from increased entry. In the immediate time frame there is only one Little LEO operator, functioning in certain submarkets. For the foreseeable future, there will be only two commercial operators. It is generally accepted that at least three competitors are required to achieve more efficiency (i.e., market based pricing). In the Little LEO industry, which has large and growing demand, and which is technically complex, characterized by many submarkets and subject to long lead time development, authorization of several new competitors -- even all of the new second round applicants -- would still produce market benefits.

It is also important to point out that it is already apparent that the lack of competition among Little LEO operators can seriously constrain market growth because of customer resistance to incurring the significant cost of switching to Little LEO services if they cannot be assured of receiving the least cost solution to their communications requirements. Full and fair competition in any or all of the Little LEO submarkets therefore will provide customers the assurance of the benefits -- lower prices, incentives for innovation and efficiency and customer service -- that normally accompany multiple entry.

II. Some Limitations of Strict Application of the SCP Paradigm

A. Little LEO Markets Are Emerging Rather Than Mature Markets

An SCP analysis is best applied in circumstances where conclusions concerning conduct and performance can be derived from analysis of actual, or at least measurable, demand and supply factors. In contrast, Little LEO markets are just now emerging. Thus, supply and demand analyses necessarily depend to a great extent on certain regulatory decisions concerning spectrum allocations and assignments that are yet to be determined.

Specifically, all Little LEO systems require phased implementation over a period of years and, at this point there are no constellations in operation. Orbcomm is the first company in the world to launch commercial Little LEO satellites, and has two satellites in orbit. However, without its full constellation, Orbcomm cannot yet provide the full complement of Little LEO services, including near real time services. Thus, although there are valid projections, there are no real world measures of supply and demand of many of the most important Little LEO applications.

By the time first and second round systems may be fully implemented (close to the end of this century), the circumstances of both supply and demand may be very different from what can now be anticipated. Little LEO systems may devise applications that are not

yet considered. Concomitantly, there may be a host of new services and technologies that can be substituted by consumers for Little LEO services.

Also, it is hoped that additional spectrum will be made available internationally to Little LEO services. However, the prospect of such additional allocations, and the assignments that ultimately might be made, are uncertain. Assumptions regarding these factors are extremely pertinent to any economic analysis. If the prospects of future allocations and assignments are ignored for the purpose of such an analysis, the results possibly will be skewed to show less effective competition from new entrants across the full range of potential Little LEO applications. On the other hand, an analysis that assumes that additional spectrum will be made available to support effective competition in near real time services requires both that new spectrum be allocated in international conferences and that at least some of the new spectrum be reserved for second round licensees. While it is actually impossible to rely on such assumptions because it cannot be known now how much spectrum may be made available in the future, it would not be appropriate for the Commission to rely upon an economic analysis that assumes no additional spectrum will become available, as then the lack of full competition will become a self-fulfilling prophecy.

In circumstances characterized by such uncertainty, the market is a better judge than regulatory policy of what is the most economically efficient industry structure.

B. Little LEO Markets are Global and Not Wholly Subject to U.S. Policy

A formal SCP analysis may have limited utility in the context of Little LEO markets which are inherently global. While the U.S. is considering whether to license three, four or more Little LEO systems, approximately 30 applications for similar systems are pending world wide. Consequently, it is virtually certain that there will be significant additional entry in the Little LEO market, regardless of whatever an SCP analysis might indicate to U.S. decisionmakers. Also, any analysis of supply and demand may be substantially affected by circumstances in other countries, out of the range of FCC jurisdiction. In this context, the most important objective for U.S. policy makers should be to maintain U.S. technology and market leadership by ensuring that U.S. entrepreneurs have maximum opportunity to enter the market and that they have the best possible opportunities to gain access to additional spectrum required to implement fully globally competitive systems.

C. Broad Generalizations Are Difficult Across Little LEO Submarkets

Traditional formal SCP model, normally applied to determine degrees of competition and/or concentration in mature markets, is not very applicable such a nascent market as Little LEO service, with very unformed supply and demand characteristics. Also, Little LEO markets have many subsegments, with different supply and demand characteristics in each. Thus, an SCP analysis does not easily support broad generalizations concerning the ability of Little LEO operators to be competitive across different market segments.

III. Notwithstanding the Limitations, SCP Principles Indicate More Competition Is Warranted in Little LEO Markets

Notwithstanding the limited usefulness of a formal SCP model in this proceeding, an analysis based generally on the SCP paradigm, using reasonable assumptions concerning spectrum availability, demonstrates that licensing of new entrants clearly is in the public interest.

A. Demand

1. Overall Levels of Demand

Demand for Little LEO services is high and growing. Demand will likely grow for the foreseeable future and is expected to be at levels that will support economies or scale benefits for six (6) suppliers or more.⁴ Successive market studies have identified progressively increasing market size and potential services. Consequently, Final Analysis anticipates customer demand for additional applications beyond those studied and documented today.

2. General Demand Features

In traditional SCP analysis, demand elasticity is a measure of customer willingness to switch suppliers to obtain lower prices or more desired service features. Demand elasticity indicates the availability of substitute services and providers that may be accessed at affordable prices. The greater the demand elasticity in a particular market, the less need there may be for introduction of additional competition. However, application of the traditional analysis assumes a certain amount of homogeneity of products. In the Notice the Commission also appears to assume a certain homogeneity of Little LEO services, referring to them categorically as "commercial radio location and two-way data messaging" or "CRL-TWDM." In fact, there are so many market segments for Little LEO services, and so many substitutes, that it is difficult to group them into a single category, and broad generalizations about demand substitutions and elasticity are very hard to make. For this reason, we do not use the Commission's acronym in this analysis, as it masks important distinctions.

Little LEO services actually are on a continuum of substitutability. At the "lower end" of the continuum of services permitted by the FCC proposal (i.e., low polling frequency or non-real time or services), are applications such as (i) meter reading and (ii) other data acquisition and non real-time monitoring. These are services for which there is significant substitutability with existing alternative providers and technologies. Therefore, there is generally currently more elasticity with these non-real time services.

⁴ See ITU-R Document 8D/136 (in Attachment B supra) for a discussion of market demand. That study covers only four (4) market applications, yet demonstrates a market large enough to support many suppliers each of which should be able to achieve economies of scale and scope.

At the "higher" end are applications that can be offered with fully implemented with systems capable of high polling frequency or near real time service (i.e, high value added services). These services include: (i) location determination and tracking; (ii) paging, (iii) email & mobile computing; (iii) alarm messages and other emergency messaging and notification; and (iv) retail (point-of-sale reporting, credit card validation, ATM reporting, direct-to-home TV shopping, and just-in-time inventory). These services have many fewer substitutes, and in some cases, satellite provision is unique, and the only substitutes are other commercial LEO services that do not yet exist and may or may not be implemented in the future. Demand elasticities for these services reasonably could be expected to be lower than for non-real time services. Consequently, additional competitive entry in these subsegments would be comparatively more meaningful.

The spectrum proposed by the Commission for assignment to second round applicants in this proceeding results in gaps in satellite coverage which will preclude second round licensees from offering any near real time services. Thus, there is no way, without allocation of additional spectrum, that second round licensees can be fully competitive with first round licensees in services that require near real time capability.

3. Service Applications

The table on the following page outlines potential Little LEO applications and services, divided into two basic categories: Low Polling Frequency and High Polling Frequency. As an initial matter, it must be noted that this table is not exhaustive. In fact, Final Analysis expects the list to continue to grow to include applications not yet imagined as additional user awareness is created.

Also, it is important to note that geographic and demographic characteristics, as they relate to system design, also can define different Little LEO submarkets. For example, in smaller service areas with greater density of user terminals, terrestrial solutions are more substitutable. Conversely, where there is substantial physical distance between a data collection service area and its assigned data analysis and control location, there are few economical substitutes for Little LEO services. The Low/High Polling Frequency characteristics are highlighted in this Market Analysis because polling frequency is a particularly critical issue under the Commission's proposal.

The list, though only illustrative, does demonstrate that: (1) there are many market segments, each having its own size, its own technical characteristics including need for real time accessibility and throughput capabilities, and its own economic characteristics; (2) price elasticity varies across the market segments; (3) the overall market is large and will likely grow as more applications are created and prices decline; and (4) all market subsegments over time will tend towards near real time solutions because all users will demand relatively immediate alerts of changes to conditions monitored.

ILLUSTRATIVE LITTLE LEO MARKET SEGMENTS

<u>Application</u>	<u>Low to Medium Polling Frequency</u>	<u>High Polling Frequency</u>
Transportation 1. Truck 2. Rail 3. Shipping Containers 4. Cargo	• Container tracking (low) • Rail car tracking (medium) • Weight sensors	• Truck Tracking (location determination) • Open/Close alerts (for security and US customs electronic surveillance initiatives) • Refrigeration unit monitoring, control, and alert
Utilities 1. Electric 2. Gas 3. Water	• Automatic meter reading (monthly, daily, load profiling) • Information to the consumer for demand side management	• Automatic meter reading (on-demand) • Tamper alert • Substation monitor, alert, and control • Transmission grid monitor, alert, and control • Load Control
Environmental	• Field data collection, and unit monitor, and control (water quality, ocean, volcano, seismic, animal tracking, soil, UV, weather, etc.)	• Environmental and natural hazard alerts
Agribusiness	• Crop condition monitoring • Irrigation, pesticide and fertilizer remote application control • Supply monitoring (feed, fertilizer, etc.) for inventory management and control	
Automotive Security	• Smart car applications (remote monitor, control and messaging)	• Roadside assistance alerts • Intrusion alerts • Stolen vehicle and other property alerts and location determination
Personal Messaging and EMail	• Two-way alphanumeric messaging (developing countries) • Remote e-mail access • Voice mail • Voice paging	• Two-way alphanumeric messaging (developing countries) • Voice mail • Voice paging

General Industrial	<ul style="list-style-type: none"> ●Inventory level monitor ●Field equipment monitor and control 	
Health	<ul style="list-style-type: none"> ●Remote monitor of patient physiological functions 	<ul style="list-style-type: none"> ●Patient condition alert
Oil & Gas	<ul style="list-style-type: none"> ●Remote well monitor and control ●Transmission grid monitor and control 	
Emergency		<ul style="list-style-type: none"> ●Emergency alerts (hiker, skier, maritime, etc.
Retail	<ul style="list-style-type: none"> ●Vending machine monitor and control ●Copier machine monitor and control 	<ul style="list-style-type: none"> ●Point of sale reporting ●Credit card validation

4. Service Substitutes

Substitutes for Little LEO services vary across market segments, and demand and elasticity vary accordingly. Complete information about substitute services is not presently available, but preliminary indications of substitutes by service submarket are summarized below.

Utility Market For the utility market there are a number of substitutes for satellite-based automated meter reading and related Little LEO service offerings. These include:

- Terrestrial fixed radio systems
- Drive-By CMRS, manual meter reading, telephone wire systems
- Powerline modulation systems

Each has advantages and disadvantages, though the primary substitutes are probably terrestrial fixed radio systems and telephone wire systems. Fixed radio systems offer continuous two-way communications and are very cost competitive in high density areas where the user requirements support the fixed location infrastructure costs. Such systems do not experience nominal communication coverage gaps in service, and can handle larger volumes of data. These systems clearly will pose significant threats to Little LEO systems in high density areas.

Telephone systems also offer low cost, two-way, flexible communications. They are cost competitive in both low and high density areas, but are restricted to data monitor and control scenarios where lines exist. In fact, however, many substations, and much of non-

residential and industrial utility equipment (street lights, highway, bill boards, remote field equipment etc.) cannot be serviced by telephone systems.

Deregulation in the utility industry may have an impact on Little LEO service substitutability. Specifically, a deregulated environment may result in a more dispersed customer base (thus customers may not be grouped in a geographic region as they are today). This may lower the customer density levels for a particular utility service provider in a particular region. This may favor Little LEO and telephone wire solutions.

Thus, while fixed radio systems today offer significant substitute threats to approximately 70% of the U.S. utility market (the high density areas), there remains 30% of the market today (the rural solution). After the year 2000, radio systems may well be less of a threat in deregulated markets.

Transportation Market: In the transportation market possible substitutes vary across the three main market subsegments: 1) trucks, 2) shipping containers, and 3) railways.

In the trucking submarket potential substitutes include fixed radio systems and geostationary mobile satellite service ("GEO MSS"). Substitutability from fixed radio will grow as these systems expand their networks. The substitutability of fixed radio systems declines as distances of truck routes increase. However, GEO MSS also may be used, at least for certain applications.

The shipping container subsegment has few substitutes, given the vast territory to be covered and the fact that transoceanic travel not supported by fixed radio systems. Even GEO MSS systems have limited scope and are of a lesser threat to Little LEOs in this submarket. However, the shipping container industry is highly competitive with low profit margins, and price pressures are created by strong consumer buying power.

In the railway submarket, substitutes include terrestrial wire, point-to-point wireless, and fixed radio systems. Most of the major rail systems are currently heavily wired with terrestrial solutions. In fact, this will be difficult subsegment for Little LEOs to penetrate. Customers need high data rates operating in real-time to provide tracking service as well as to support safety systems and ensure operational efficiency. Such applications as automated locomotive control and rail car tracking require distributed processing networks with high speed processors to handle large data volumes with low latency rates.

Environmental Market: The environmental market is served by a fragmented set of solutions that vary with cost and geographic conditions. Substitutes to Little LEO services include localized solutions such as fixed radio networks, telephone systems, and the NOAA GOES and ARGOS systems. Both fixed radio systems and telephone systems tend to face hurdles in some remote areas where environmental data must be monitored. In some cases (such as the Florida Everglades), fixed radio systems are somewhat significant substitutes. In other cases, substitutes may be somewhat costly.

Other Market Segments: To date, other market segments such as the automotive and agribusiness markets have not utilized remote two-way data communications to any great degree, and it is therefore less clear as to what if any substitutes might exist.

5. Costs of Switching

It is important to recognize that, at the present time, Little LEO services are actually the new substitute threat in many market segments. Due to the switching costs, system disruption and reconfiguration, and other effects on the customer, there is significant resistance among customers against switching from other services to Little LEO applications. In particular, customers of many of the industrial Little LEO applications must purchase thousands or tens of thousands of terminals. Each terminal may cost from \$100 to \$500. Additional costs must be incurred for installation, implementation of data processing software and integration of the Little LEO service with other customer communications systems.

Resistance to switching is aggravated by the current lack of an established multi-supplier industry, which gives rise to various customer concerns. For example, customers are unsure about trends in Little LEO service price points over time, and relative to the substitutes or current comparable services. Also, Little LEO services are a new technology. Some customers are concerned about the long term reliability, efficiency, and sustainability of the technology. The lack of standardization in the Little LEO market further increases the risk. Customers in many submarkets must make a sizable commitment to Little LEO service, through investment in perhaps tens of thousands of terminals, training of personnel, implementation of new software and modification of corporate procedures. Customers may be reluctant to make such an investment if they believe that concentration in the market carries the risk of supplier non-responsiveness including high prices and low service availability.

6. Summary of Demand Issues

Overall demand for Little LEO services is expected to be very high and capable of supporting several systems. Absolute demand is impossible to quantify because systems are not yet fully implemented and new applications continue to emerge. However, it appears that the overall potential market is sufficiently large to support economies of scale and scope for multiple suppliers.

Demand elasticities vary across subsegments. Applications characterized by lower polling frequency and/or smaller throughput may have greater available substitutes, and be more demand elastic than applications characterized by higher polling frequency (near real time) and/or larger throughput. While greater competition would be beneficial in both categories, it is most certainly indicated in near real time submarkets where there are very few good substitutes.

Also, although in many applications Little LEOs are currently the horizon technology, and itself constitutes a substitute threat to other established technologies, non-standard

terminals and significant terminal costs contribute to significant customer resistance to switching to Little LEOs, as well as presumably among alternative Little LEO suppliers. Additional Little LEO competition would help drive down prices and make the full range of Little LEO services more attractive

B. Supply

1. Potential Rival Suppliers

There are many entities that can provide some of the same services proposed by Little LEOs, including Big LEOs, other global mobile satellite companies and terrestrial commercial radio operators in the paging, specialized mobile radio and personal communications services. The true substitutability of any of these services is a combination of the technical characteristics of the service (including quality and availability) and price features. Many of these technical and price features cannot yet be known.

Due to the cost of Big LEO systems (terminals and service rates), their services may not be truly substitutable with Little LEO applications. While Big LEOs may serve some high-end needs in the personal communications market (personal two-way messaging), such services typically will be bundled (i.e., offered with basic voice service) rather than offered on a stand alone basis. Also, although some of their ancillary services do address Little LEO market areas, Big LEOs cannot offer the same range of services as Little LEOs. For example, Big LEOs have not evidenced an intention to serve industrial applications characterized by small data bursts, such as meter reading, asset tracking, or environmental monitoring.

Similar to the Big LEOs, geostationary satellites ("GSOs") offer some technically substitutable services, but at a much higher price. GSOs are cost effective in the provision of higher rate, higher bandwidth communications for video, voice, and high volume data. GSOs do present a viable alternative in a few niche areas in which buyers are not necessarily price sensitive, and the need for continuous communications within a regional solution is required. This may be true, for example for tracking in regional trucking markets.

In the environmental market, the GOES system is a direct substitute. NOAA uses this system to provide two-way data services to U.S. government agencies and their affiliates. Although the long term plans for GOES are unclear, in the near term, it is a very attractive substitute for commercial Little LEO service.

In summary, Big LEOs and GSOs may provide similar services for many applications, but most likely at a much higher price than Little LEOs. In the long run, these systems cannot be relied upon to provide vigorous competition to Little LEOs service.

2. Barriers to Entry

Significant barriers exist to market entry by Little LEOs. Some of the more significant barriers for consideration in this analysis include the following:

- **Limited spectrum availability:** This is a critical problem. As evidenced by this proceeding, currently available spectrum is heavily occupied and sharing requirements are onerous. This severely limits the market potential of Little LEOs. Additional spectrum may be allocated at WRC-97. However, the maximum possible support from the U.S. Little LEO industry, as well as from the U.S. government, will be required to ensure necessary additional allocations. In this respect, having six or more U.S. Little LEO licensees working together and with the U.S. government to obtain additional allocations at WRC-97 would be beneficial for the entire industry as well as the public.
- **Long development time:** The time required to design and develop such a system is long, requiring several years of capital expenditures before revenue flows can begin, and several more years before operations become profitable. This is a deterrent as well.
- **Strong, long lead first to market supplier:** The existence of Orbcomm as virtually the only commercial supplier for the first several years creates a significant first to market advantage. In an industry characterized by high switching costs and a lack of standardization, the advantages enjoyed by the market leader, including economies of scale, tend to deter other entrants.
- **Difficult access to foreign markets.** As a new technology and service, Little LEOs must gain acceptance in each individual country. Each country not only must allocate and assign frequencies, but also must establish appropriate regulatory regimes for the implementation of Little LEO applications. Again, licensing of several competitors in the Little LEO industry would provide important international assistance for the ability of individual operators to gain access to particular markets, by facilitating international understanding of the technology and services and developing knowledge of and solutions to individual country issues.

In response to the Commission's request for comments on how these barriers to entry may be lowered, we offer the following points:

- **Expedite competition:** The Commission should take quick action to allow second round applicants to deploy and enter the market. There is a compelling need to mitigate the first to market entry barrier created by the licensing of the first round applicants well ahead of the second round, and the single supplier reality in the marketplace today.

- No auction: The auction process creates additional barriers to entry, especially when the international auction affect is considered.
- Support allocation of additional spectrum to alleviate spectrum timesharing requirements. The NPRM has proposed three Little LEO licenses, all of which have significant service gaps due to the frequency sharing requirements. These gaps have a significant impact on the market capability of the license holder. Further, they place these second round applicants at a significant service disadvantage to the first round licensees, adding to the already significant first to market advantage already held by the first round licensees. The combination of these factors create additional barriers to entry.
- Expediently create a fair and vigorous competition: Mitigate the strong first to market position of the current reality in the market, and remove the uncertainty within the industry and its potential buyers.

3. Unevenness of Supply Substitutability

In a traditional SCP analysis, it is usually assumed that competitors operate on equal footing and that each competitor can expand infinitely. In this context, supply substitutability or elasticity indicates that a company's rivals can constrain its potentially anticompetitive behavior by entering or threatening to enter the market. Indications of elasticity are ease of entry and excess capacity. However, the Little LEO market is different than most subject to SCP analysis, and this analysis does not easily apply.

In particular, first round licensees and second round applicants are not on equal footing. The first round licensees may provide a full complement of Little LEO services across the full range of applications, intermittent and near real time. Second round licensees will be constrained and will be unable to expand their systems, at least initially, to compete fully and effectively with first round licensees because of spectrum limitations. As demonstrated in the main body of Final Analysis's Comments in this proceeding, under the Commission's proposal, under the Commission's time sharing proposal, none of the second round applicants, if licensed, will be able to provide anything close to near real time service applications. Thus, in this case, even if competitors wanted to or otherwise had the resources to expand services to meet demand or to offer services in less elastic markets, they may not be able to because of the lack of adequate spectrum.

Consequently, the lower end more elastic services will experience more supply substitutability, while the less elastic higher end services most in need of competition, will not have increased competition, at least until additional spectrum is made available on a global basis from future radio conferences. Thus, the lack of spectrum is a significant barrier to entry and is a serious impediment to achievement of a fully competitive market in the less elastic services.

4. Summary of Supply Issues

This analysis shows that potential suppliers of alternative, or substitute, technologies exist. In the case of high polling frequency, or near real time services, however, there are few economical substitutes.

In terms of rival suppliers of Little LEO services, it is noted that the current market structure is concentrated, and that even under the Commission's current proposal concentration of Little LEO supply in near real time services will not be improved. Also, there are significant barriers to entry. Several barriers to entry, including availability of additional spectrum and access to foreign markets, could be significantly alleviated by licensing of more entrants to create a "critical mass" of U.S. industry participants.

C. Market Structure

1. Lack of Fair Competition

As discussed above, the Little LEO market is not yet fully competitive. One first round licensee, Orbcomm, has yet to fully implement its system, but has significant first-to-market advantages. The only other commercial licensee, Starsys, has not begun to implement its system.

Also, as discussed above, under the Commission's proposal, second round licensees will not be competitive with first round licensees, particularly in market subsegments requiring near full time service. These are the submarkets that, under the above SCP-type analysis, are currently least demand and supply elastic, and in which public benefits due to additional competitive entry would be the greatest.

Therefore, there are compelling reasons for the Commission to take extraordinary steps to expeditiously create a truly fair and vigorous competitive environment. Such a competitive environment must be fair, allowing all suppliers to offer compatible services. Because currently available spectrum constrains the creation of truly competitive conditions, the Commission should include, as part of the competitive policies adopted in this proceeding, mechanisms that ensure that second round licensees gain access to additional spectrum required to permit implementation of near real time services.

2. Economies of Scale

There are two aspects to the economies of scale issue: 1) achieving enough service scale to meet infrastructure non-recurring and recurring cost requirements, and create profit within a period of time and at a level required within the financial community, and 2) achieving a level of scale necessary to drive the terminal costs down to the least cost solution.

Final Analysis calculates that the level of market share required to achieve the service level needed to create conditions attractive to the financial and investment communities is under 10% of the total market (with market size conservatively defined as that described in the ITU-R Document 8D/136). A Little LEO supplier needs to achieve a customer base that utilizes several million terminals to realize benefits of economies of scale. With Little LEO market size conservatively estimated at 49 million terminals,⁵ many suppliers can be accommodated. Consequently, economies of scale can be achieved, even with more than three (3) and even up to six (6) or more commercial suppliers of Little LEO services.

IV. Conduct and Performance

A. The Appropriate Measure of Performance

In assessing the relationships between structure, conduct and performance, recent economic studies have tended to focus on the nexus between concentration and prices. The current view, buttressed by such studies and embodied in the Department of Justice/Federal Trade Commission merger guidelines⁶, is that concentration does tend to raise prices.⁷ This is true even in the absence of explicit collusion.⁸ Thus, particularly in oligopolistic markets,

⁵ This estimate is for only four market segments. The total overall market is undoubtedly larger.

⁶ Janusz A. Ordover and Robert D. Willig, "The 1982 Department of Justice Guidelines: An Economic Assessment," *California Law Review* (March 1983), P. 555. See also Department of Justice and Federal Trade Commission, *Horizontal Merger Guidelines*, April 2, 1992.

⁷ Leonard W. Weiss, ed., *Concentration and Price* (Cambridge, MA: The M.I.T. Press, 1989). This study reflected an ambitious effort to look at relationships in a wide variety of industries.

⁸ Professor F.M. Scherer, a leading authority on industrial organization, notes in Industrial Market Structure and Economic Performance (3d. Edition), 1990, p. 226:

Any realistic theory of oligopoly must take as a point of departure the fact that when market concentration is high, the pricing decisions of sellers are interdependent and the firms involved can scarcely avoid recognizing their mutual interdependence. Perceptive managers will recognize that their profits will be higher when cooperative policies are pursued than when each firm looks only after its own narrow self-interest. As a consequence, even in the absence of any formal collusion among firms, we should expect tightly oligopolistic industries to exhibit a tendency toward the maximization of collective profits, perhaps even approaching the pricing outcome associated with pure monopoly.

the introduction of more players has a beneficial effect. One study has shown that a third significant competitor had a major significant effect on price/cost margins, because "three firm coordination problems are so severe as to make a third firm more likely a rival."⁹

Under theories of oligopoly behavior, small numbers competition can result in a full range of conduct from joint profit maximization to cutthroat competition.¹⁰ Generally, the relationship between the number of competitors (structure) on performance (price) in models of oligopoly depends on conduct (whether firms choose prices or quantities as the strategic variable). If firms choose prices, the Bertrand model of price competition predicts that only two firms are necessary to produce the perfectly competitive outcome.¹¹ This prediction is so "unrealistic" that theory usually turns to the Cournot model, where firms choose quantities (based on their "conjectures" as to the response of competitors). There, to the extent there is consensus, the models usually predict an adverse effect of industry concentration on economic welfare as measured by price.¹² Thus, additional competitors beyond three also can improve economic welfare.

B. Assessment of the Little LEO Industry

Translated to the Little LEO market, it can be assumed, consistent with and SCP and other widely accepted economic principles, that licensing of additional entrants in this round would bring palpable benefits to all Little LEO submarkets. In the lower end submarkets (characterized by low polling frequency and/or lower throughput), additional competitors would be important to reducing customer perception of risk in switching to new Little LEO services. At the same time, additional commercial entrants beyond the two current commercial licensees would have a beneficial effect on price. This remains important in these submarkets, even though there may be substitutes, in some circumstances, for Little LEO services. This is because, as mentioned above, even in the relevant service submarkets

⁹ John E. Kwoka, Jr., "The Effect of Market Share Distribution on Industry Performance," *Review of Economics and Statistics*, Vol. LXI, No. 1 (February 1979), pp. 101-109. This result appears to parallel results of game theory, where the addition of only one more party to a strategic interaction creates an entirely new and far more complex situation. See Howard Raiffa, *The Art of Science of Negotiation* (Cambridge, MA: Harvard University Press, 1982), pp. 251 and 257.

¹⁰ Richard C. Levin, "Railroad Rates and Profitability and Welfare Under Deregulation," *Bell Journal of Economics*, Vol. 12, No. 1 (Spring 1981), pp. 3 and 20.

¹¹ See Andreu Mas-Colell, Michael D. Whinston, and Jerry R. Green, *Microeconomic Theory* (1995), pp. 388-389 for an analysis of oligopoly behavior in the Bertrand model.

¹² Carl Shapiro, "Theories of Oligopoly Behavior," Chapter 16 in *Handbook of Industrial Organization*, Vol. 1 (Amsterdam: North-Holland, 1989), Richard Schmalensee and Robert D. Willig, eds.